ENERGY-WORK-POWER

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AN UNDERSTATED FUEL-SIPPER

INTRODUCTION: **Power output (useful power to the wheels) divided by Power input = efficiency X Power output P_{OUTPUT} goes into $Work_{OUTPUT}$/ time. W_{OUT} goes into kinetic energy at the wheels = ½ m v^2 . Thus, $P_{OUTPUT} = P_{INOUT}$ X = [½ m v^2]/t**

$$X = m v^2 / 2 P_{INPUT} t$$

QUESTIONS: **(a)Sonata site says weight = 3377 lb. Find mass(in slugs)? (b) Convert 202 HP to ft. lb./s. (c) Find efficiency X of Sonata? (d) Comment**

The **Sonata plug-in's** only real competition is the Ford Fusion Energi, which travels close to 19 miles solely on electricity before defaulting to standard gas/electric hybrid operation. Hyundai beats that range by eight miles. True, the Chevy Volt gets 50 miles from its battery pack, but it's a much smaller car. And for those who hadn't noticed, Honda dropped the Accord plug-in. Hyundai's plug-in joins gas-only and standard hybrid Sonatas. **Starting at $35,435** before government incentives, the plug-in model is $3,600 more than the standard hybrid, after the $4,910 federal tax credit is applied. The two share a 2-liter gasoline engine, but the electric drive motor built into the transmission is more powerful in the plug-in. The 50-kilowatt motor takes the place of a torque converter. This clever piece of engineering contributes to **202 total horsepower(P_{INPUT})**. When the battery is out of juice, the car seamlessly switches to gas/electric hybrid operation, a dynamic Toyota's Prius always runs in. The Environmental Protection Agency rates the plug-in at 99 miles per gallon over all and 40 m.p.g. in hybrid mode — a figure that is easy to achieve. Concentrating on the unique gauge cluster and center-screen graphics might have improved my results. The standard Sonata hybrid is slightly more efficient than the plug-in when it's using both power sources. **Dashing from rest to 60 miles per hour in a little more than eight seconds,**

HINTS: weight = (mass) x (gravity) = m g , g = 32 ft./s.^{2} , 60 mph = 88 ft./s.

ANSWERS: (a) m = 105.53 slugs, (b) P_{INPUT} = 111,100 ft. lb./s., (c) X = 46 % efficient

(d) **46 % efficiency seems appropriate for this electric hybrid since pure turbos are about 40 %. Pure electric would have efficiencies 50 – 60 % by government standards.**